

## CLAIMS

What is claimed is:

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1. A bearing race assembly for use in a swivel joint comprising:

a male connector having a central axis, a first end, and a plurality of outer annular grooves each having a generally arcuate cross-section and laying in a respective plane generally perpendicular to said central axis, said outer grooves each having a generally constant radius measured from said central axis whereby each said outer groove has a greater radius than each adjacent outer groove closer to said first end;

a female connector coaxially aligned with said male connector and adapted to receive and fit around said male connector, said female connector having a first end and a plurality of inner annular grooves each having a generally arcuate cross-section and laying in a respective plane generally perpendicular to said central axis, said inner grooves each corresponding to one of said outer grooves and forming therewith an arcuate race; and

a plurality of ball bearings received in each race to facilitate relative rotation of said male and female connectors about said central axis.

2. A bearing race assembly according to claim 1, wherein

each said male connector and said female connector has a central opening therethrough coaxially aligned about said central axis forming a fluid flow passage.

3. A bearing race assembly according to claim 2 wherein

said first end of said male connector has a recessed inner annular portion;

said female connector has a recessed inner annular portion adjacent to said male connector recessed inner annular portion when said male connector is received in said female connector, such that said inner

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annular portions of said male and female connectors together form an inner annular seal groove;

an annular seal having an outer sealing surface is received in said seal bore thereby sealing against inner circumferential surfaces of said inner portions of said male and female connectors, said seal having an inner surface generally flush with said fluid flow passage.

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92) 4. A bearing race assembly according to claim 3, wherein  
said seal is made of a non-metallic material.

Sub 63) 5. A bearing race assembly according to claim 4, wherein  
said seal is a radial compression fit seal.

6. A bearing race assembly for use in a swivel joint comprising:

a male connector having a central axis, a first end, and a plurality of outer annular grooves each having a generally arcuate cross-section and laying in a respective plane generally perpendicular to said central axis, said outer grooves each having a generally constant radius measured from said central axis whereby each said outer groove has the same radius;

a female connector coaxially aligned with said male connector and adapted to receive and fit around said male connector, said female connector having a first end and a plurality of inner annular grooves each having a generally arcuate cross-section and laying in a respective plane generally perpendicular to said central axis, said inner grooves each corresponding to one of said outer grooves and forming therewith an arcuate race;

a plurality of ball bearings received in each race to facilitate relative rotation of said male and female connectors about said central axis;

each said male connector and said female connector has a central opening therethrough coaxially aligned about said central axis forming a fluid flow passage;

said first end of said male connector has a recessed inner annular portion;

said female connector has a recessed inner annular portion adjacent to said male connector recessed inner annular portion when said male connector is received in said female connector, such that said inner annular portions of said male and female connectors together form an inner annular seal groove;

an annular seal having an outer sealing surface is received in said seal bore thereby sealing against inner circumferential surfaces of said inner portions of said male and female connectors, said seal having an inner surface generally flush with said fluid flow passage.

7. A bearing race assembly according to claim 6, wherein

said seal is made of a non-metallic material.

8. A bearing race assembly according to claim 7, wherein

said seal is a radial compression fit seal.

9. A bearing race assembly comprising:

a first tube-shaped member having an outer generally annular groove of generally arcuate cross-section defined by a first radius;

a second tube-shaped member having an inner generally annular groove of a generally arcuate cross-section defined by said first radius, whereby said inner groove has a section located at the apex of the generally arcuate cross-section comprising a straight line segment;

said first member is adapted to be telescopically received in said second member such that said outer and inner grooves align forming a generally annular race;

a plurality of ball bearings received in said race, said ball bearings each having a radius substantially the same as said first radius, said ball bearings facilitating relative rotation of said first and second tube-shaped members.

10. A bearing assembly according to claim 9, wherein

said outer groove has a section located at the apex of the generally arcuate cross-section comprising a straight line segment.

11. A bearing race assembly comprising:

a first tube-shaped member having an outer generally annular groove of generally arcuate cross-section defined by a first radius, whereby said outer groove has a section located at the apex of the generally arcuate cross-section comprising a straight line segment;

a second tube-shaped member having an inner generally annular groove of a generally arcuate cross-section defined by said first radius;

said first member is adapted to be telescopically received in said second member such that said outer and inner grooves align forming a generally annular race;

a plurality of ball bearings received in said race, said ball bearings each having a radius substantially the same as said first radius, said ball bearings facilitating relative rotation of said first and second tube-shaped members.

12. A bearing assembly according to claim 9, wherein

said inner groove has a section located at the apex of the generally arcuate cross-section comprising a straight line segment.

13. A bearing race assembly for use in a swivel joint comprising:

a pair of oppositely opposed tube-shaped connecting members each having a central axis coaxial with the other and a plurality of outer annular grooves, said members being positioned such that a first end of each is adjacent to the other, each groove having a generally arcuate cross-section and laying in a respective plane generally perpendicular to said central axis, said outer grooves each having a generally constant

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\* radius measured from said central axis whereby each said outer groove has a greater radius than each adjacent outer groove closer to each respective said first end;

a collar coaxially aligned with said connecting members and adapted to receive and fit around said connecting members, said collar having a plurality of inner annular grooves each having a generally arcuate cross-section and laying in a respective plane generally perpendicular to said central axis, said inner grooves each corresponding to one of said outer grooves and forming therewith an arcuate race; and

a plurality of ball bearings received in each race to facilitate relative rotation of said connecting members and said collar about said central axis.

7 ~~14~~. A bearing race assembly according to claim ~~13~~, wherein

each said connecting member and said collar has a central opening therethrough coaxially aligned about said central axis forming a fluid flow passage.

8 ~~15~~. A bearing race assembly according to claim ~~14~~ wherein

each said first end of said connecting members has a recessed inner annular portion such that said inner annular portions together form an inner annular seal groove;

an annular seal having an outer sealing surface is received in said seal bore thereby sealing against inner circumferential surfaces of said inner portions, said seal having an inner surface generally flush with said fluid flow passage.

9 ~~16~~. A bearing race assembly according to claim ~~15~~, wherein

said seal is made of a non-metallic material.

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~~10~~ ~~3~~ A bearing race assembly according to claim ~~16~~, wherein

said seal is a radial compression fit seal.

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